

Preliminary

TOSHIBA Photocoupler GaAlAs IRED + Photo IC

TLP705

Plasma Display Panel.

Industrial Inverter

IGBT/Power MOS FET Gate Drive

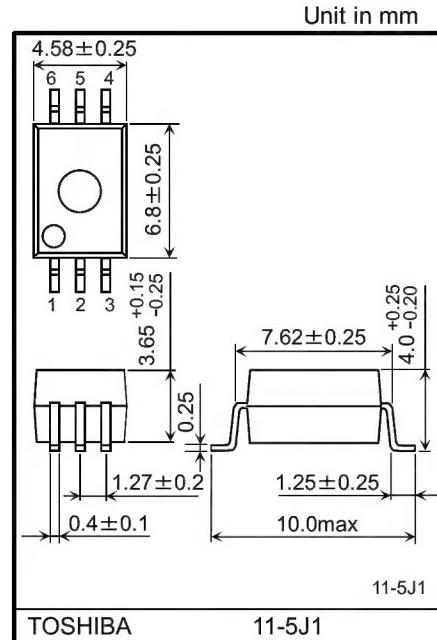
The TOSHIBA TLP705 consists of a GaAlAs light emitting diode and a integrated photodetector.

This unit is 6-lead SDIP package. TLP705 is 50% smaller than 8PIN DIP and has suited the safety standard reinforced insulation class.

So mounting area in safety standard required equipment can be reduced. TLP705 is suitable for gate driving circuit of IGBT or power MOS FET. Especially TLP705 is capable of "direct" gate drive of low Power IGBTs.

- Peak output current : ± 0.45 A (max)
- Operating frequency : 250kHz (max)
- Guaranteed performance over temperature : -40 to 100°C
- Supply current : 3mA (max)
- Power supply voltage : 10 to 20 V
- Threshold input current : $I_{FLH} = 8$ mA (max)
- Switching time (t_{pLH} / t_{pHL}) : 200 ns (max)
- Common mode transient immunity : 10 kV/ μ s
- Isolation voltage : 5000 Vrms
- UL Recognized : UL1577, File No.E67349
- Construction Mechanical Rating

| | 7.62 mm pitch standard type | 10.16 mm pitch TLPXXXF type |
|----------------------|--------------------------------|--------------------------------|
| Creepage Distance | 7.0 mm (Min) | 8.0 mm (Min) |
| Clearance | 7.0 mm (Min) | 8.0 mm (Min) |
| Insulation Thickness | 0.4 mm (Min) | 0.4 mm (Min) |

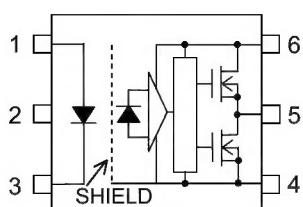


TOSHIBA 11-5J1

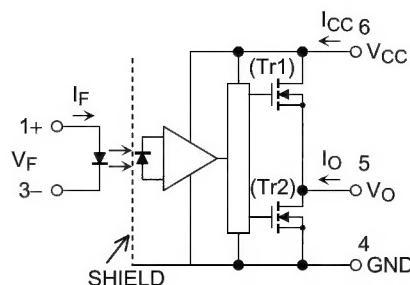
Weight: 0.26 g (typ.)

Truth Table

| Input | LED | Tr1 | Tr2 | Output |
|-------|-----|-----|-----|--------|
| H | ON | ON | OFF | H |
| L | OFF | OFF | ON | L |

Pin Configuration (top view)

- 1: Anode
- 2: NC
- 3: Cathode
- 4: GND
- 5: V_O (output)
- 6: V_{CC}

Schematic

A 0.1 μ F bypass capacitor must be connected between pin 6 and 4. (See Note 6)

Maximum Ratings (Ta = 25°C)

| Characteristics | | Symbol | Rating | Unit |
|---|---|----------------------|------------|-------|
| LED | Forward current | I _F | 20 | mA |
| | Forward current derating (Ta ≥ 85°C) | ΔI _F /ΔTa | -0.54 | mA/°C |
| | Peak transient forward current (Note 1) | I _{FP} | 1 | A |
| | Reverse voltage | V _R | 5 | V |
| | Junction temperature | T _j | 125 | °C |
| Detector | "H" peak output current (Note 2) | I _{OPH} | -0.45 | A |
| | "L" peak output current (Note 2) | I _{OPL} | 0.45 | A |
| | Output voltage | V _O | 25 | V |
| | Supply voltage | V _{CC} | 25 | V |
| | Junction temperature | T _j | 125 | °C |
| Operating frequency (Note 3) | | f | 250 | kHz |
| Storage temperature range | | T _{stg} | -55 to 125 | °C |
| Operating temperature range | | T _{opr} | -40 to 100 | °C |
| Lead soldering temperature (10 s) (Note 4) | | T _{sol} | 260 | °C |
| Isolation voltage (AC, 1 minute, R.H. ≤ 60%) (Note 5) | | BV _S | 5000 | Vrms |

Note 1: Pulse width P_W ≤ 1μs, 300 pps

Note 2: Exponential waveform pulse width P_W ≤ 10 μs , f ≤ 15 kHz

Note 3: Exponential waveform I_{OPH} ≤ -0.25 A (≤ 80 ns) , I_{OPL} ≤ +0.25 A (≤ 80 ns) , Ta = 100 °C

Note 4: It is effective soldering area of Lead .

Note 5: Device considerd a two terminal device: pins 1, 2 and 3 shorted together, and pins 4, 5 and 6 shorted together.

Note 6: A ceramic capacitor(0.1 μF) should be connected from pin 6 to pin 4 to stabilize the operation of the high gain linear amplifier. Failure to provide the bypassing may impair the switching property.
The total lead length between capacitor and coupler should not exceed 1 cm.

Recommended Operating Conditions

| Characteristics | Symbol | Min | Typ. | Max | Unit |
|----------------------------|-------------------------------------|-----|------|--------|------|
| Input current, ON (Note 7) | I _F (ON) | 10 | — | 15 | mA |
| Input voltage, OFF | V _F (OFF) | 0 | — | 0.8 | V |
| Supply voltage | V _{CC} | 10 | — | 20 | V |
| Peak output current | I _{OPH} / I _{OPL} | — | — | ± 0.15 | A |
| Operating temperature | T _{opr} | -40 | — | 100 | °C |

Note 7: Input signal rise time (fall time) < 0.5 μs.

Electrical Characteristics (Ta = -40 to 100°C, unless otherwise specified)

| Characteristics | Symbol | Test Circuit | Test Condition | | Min | Typ.* | Max | Unit |
|--|----------------------|-------------------|-----------------------------------|---|---|-------|-------|-------|
| Forward voltage | V _F | — | I _F = 10 mA, Ta = 25°C | | — | 1.6 | 1.8 | V |
| Temperature coefficient of forward voltage | ΔV _F /ΔTa | — | I _F = 10 mA | | — | -2.0 | — | mV/°C |
| Input reverse current | I _R | — | V _R = 5 V, Ta = 25°C | | — | — | 10 | μA |
| Input capacitance | C _T | — | V = 0 V, f = 1 MHz, Ta = 25°C | | — | 45 | — | pF |
| Output current (Note 8) | "H" Level | I _{OPH1} | 1 | V _{CC} = 15 V I _F = 10 mA | V ₆₋₅ = 4 V | -0.15 | -0.35 | — |
| | | I _{OPH2} | | | V ₆₋₅ = 10 V | -0.3 | -0.6 | — |
| | "L" Level | I _{OPL1} | 2 | V _{CC} = 15 V I _F = 0 mA | V ₅₋₄ = 2 V | 0.15 | 0.36 | — |
| | | I _{OPL2} | | | V ₅₋₄ = 10 V | 0.3 | 0.62 | — |
| Output voltage | "H" Level | V _{OH} | 3 | V _{CC} = 10 V | I _O = -100 mA, I _F = 10 mA | 6.0 | 8.5 | — |
| | "L" Level | V _{OL} | | | I _O = 100 mA, V _F = 0.8 V | — | 0.4 | 1.0 |
| Supply current | "H" Level | I _{CCH} | 5 | V _{CC} = 10 to 20 V V _O open | I _F = 10 mA | — | 2.0 | 3.0 |
| | "L" Level | I _{CCL} | | | I _F = 0 mA | — | 2.0 | 3.0 |
| Threshold input current | L → H | I _{FLH} | — | V _{CC} = 15 V, V _O > 1 V | | — | 2.5 | 8 |
| Threshold input voltage | H → L | V _{FHL} | — | V _{CC} = 15 V, V _O < 1 V | | 0.8 | — | — |
| Supply voltage | V _{CC} | — | — | | 10 | — | 20 | V |

*: All typical values are at Ta = 25°C

Note 8: Duration of I_O time ≤ 50 μs

Note 9: This product is more sensitive than the conventional product to static electricity (ESD) because of a lowest power consumption design.

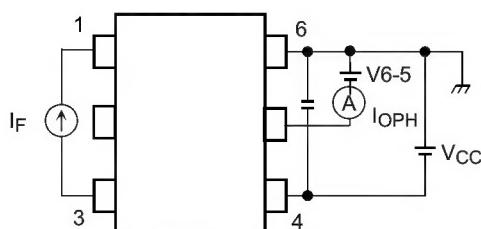
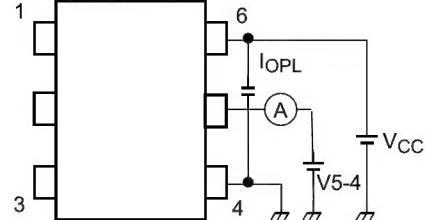
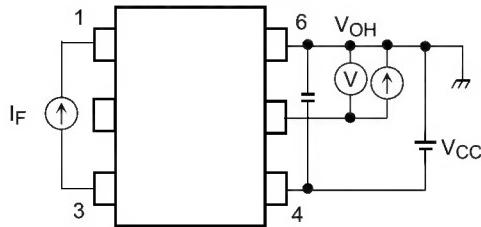
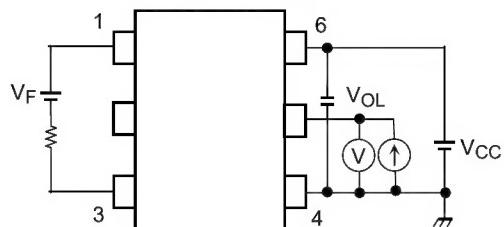
General precaution to static electricity (ESD) is necessary for handling this component.

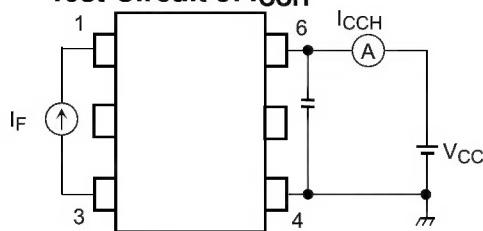
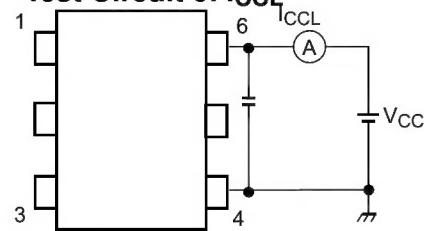
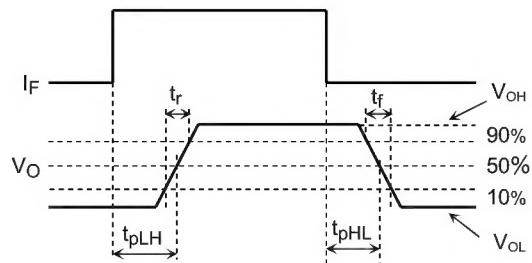
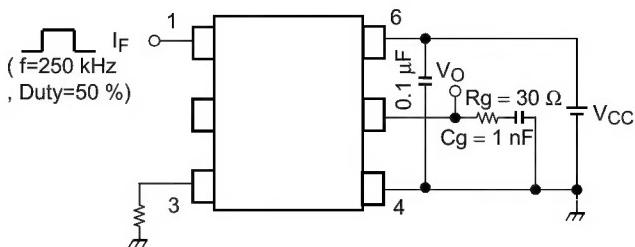
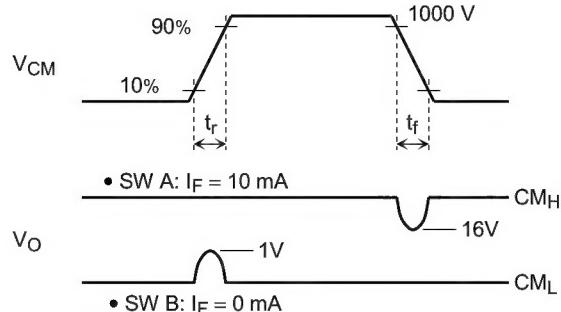
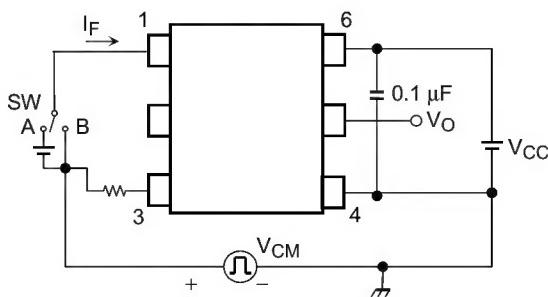
Isolation Characteristics (Ta = 25°C)

| Characteristic | Symbol | Test Condition | | Min. | Typ. | Max. | Unit |
|-----------------------------|----------------|---|--|--------------------|------------------|------|------------------|
| Capacitance input to output | C _S | V = 0 V, f = 1MHz (Note 5) | | — | 1.0 | — | pF |
| Isolation resistance | R _S | R.H. ≤ 60%, V _S = 500V (Note 5) | | 1×10 ¹² | 10 ¹⁴ | — | Ω |
| Isolation voltage | BVs | AC, 1 minute | | 5000 | — | — | V _{rms} |
| | | AC, 1 second, in oil | | — | 10000 | — | |
| | | DC, 1 minute, in oil | | — | 10000 | — | Vdc |

Switching Characteristics ($T_a = -40$ to 100°C , unless otherwise specified)

| Characteristics | | Symbol | Test Circuit | Test Condition | | Min | Typ.* | Max | Unit |
|--|-------|-----------|--------------|---|--|--------|-------|-----|------------|
| Propagation delay time | L → H | t_{pLH} | 7 | $T_a = 25^\circ\text{C}$ $I_F = 0 \rightarrow 10 \text{ mA}$ | 70 | 95 | 170 | ns | |
| | H → L | t_{pHL} | | | 70 | 105 | 170 | | |
| Propagation delay time | L → H | t_{pLH} | 7 | $V_{CC} = 20 \text{ V}$ $R_g = 30 \Omega$ $C_g = 1 \text{ nF}$ $f = 250 \text{ kHz}$ Duty Cycle = 50% | 50 | — | 200 | | |
| | H → L | t_{pHL} | | 50 | — | 200 | | | |
| Propagation delay difference between any two parts or channels | | t_{PSK} | | $T_a = -40$ to 100°C $I_F = 10 \rightarrow 0 \text{ mA}$ | -90 | — | 90 | | |
| Pulse Width Distortion ($t_{pHL} - t_{pLH}$) | | PWD | | $T_a = -40$ to 100°C $I_F = 10 \text{ mA}$ | -65 | — | 65 | | |
| Output rise time (10-90%) | | t_r | | $I_F = 0 \rightarrow 10 \text{ mA}$ | — | — | — | | |
| Output fall time (90-10%) | | t_f | | $I_F = 10 \rightarrow 0 \text{ mA}$ | — | — | — | | |
| Common mode transient immunity at high level output | | CM_H | 8 | $V_{CM} = 1000 \text{ Vp-p}$ $V_{CC} = 20 \text{ V}$ $T_a = 25^\circ\text{C}$ | $I_F = 10 \text{ mA}$ $V_O (\min) = 16 \text{ V}$ | -10000 | — | — | V/ μ s |
| Common mode transient immunity at low level output | | CM_L | | $I_F = 0 \text{ mA}$ $V_O (\max) = 1 \text{ V}$ | 10000 | — | — | | |

*: All typical values are at $T_a = 25^\circ\text{C}$ Test Circuit 1: I_{OPH} Test Circuit 2: I_{OPL} Test Circuit 3: V_{OH} Test Circuit 4: V_{OL} 

Test Circuit 5: I_{CCH} **Test Circuit 6: I_{CCL}** **Test Circuit 7 : t_{PLH} , t_{PHL} , tr , tf , PWD****Test Circuit 8: CM_H , CM_L** 

$$CM_L = \frac{800 \text{ V}}{t_r (\mu\text{s})}$$

$$CM_H = - \frac{800 \text{ V}}{t_f (\mu\text{s})}$$

CM_L (CM_H) is the maximum rate of rise (fall) of the common mode voltage that can be sustained with the output voltage in the low (high) state.

RESTRICTIONS ON PRODUCT USE

030619EBC

- The information contained herein is subject to change without notice.
- The information contained herein is presented only as a guide for the applications of our products. No responsibility is assumed by TOSHIBA for any infringements of patents or other rights of the third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of TOSHIBA or others.
- TOSHIBA is continually working to improve the quality and reliability of its products. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical sensitivity and vulnerability to physical stress. It is the responsibility of the buyer, when utilizing TOSHIBA products, to comply with the standards of safety in making a safe design for the entire system, and to avoid situations in which a malfunction or failure of such TOSHIBA products could cause loss of human life, bodily injury or damage to property.
In developing your designs, please ensure that TOSHIBA products are used within specified operating ranges as set forth in the most recent TOSHIBA products specifications. Also, please keep in mind the precautions and conditions set forth in the "Handling Guide for Semiconductor Devices," or "TOSHIBA Semiconductor Reliability Handbook" etc..
- The TOSHIBA products listed in this document are intended for usage in general electronics applications (computer, personal equipment, office equipment, measuring equipment, industrial robotics, domestic appliances, etc.). These TOSHIBA products are neither intended nor warranted for usage in equipment that requires extraordinarily high quality and/or reliability or a malfunction or failure of which may cause loss of human life or bodily injury ("Unintended Usage"). Unintended Usage include atomic energy control instruments, airplane or spaceship instruments, transportation instruments, traffic signal instruments, combustion control instruments, medical instruments, all types of safety devices, etc.. Unintended Usage of TOSHIBA products listed in this document shall be made at the customer's own risk.
- The products described in this document are subject to the foreign exchange and foreign trade laws.
- TOSHIBA products should not be embedded to the downstream products which are prohibited to be produced and sold, under any law and regulations.
- GaAs(Gallium Arsenide) is used in this product. The dust or vapor is harmful to the human body. Do not break, cut, crush or dissolve chemically.